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malting Ale Processes

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PROVISIONAL SPECIFICATION.

**Improvements in or relating to the Production of Alcoholic Liquors,
Flour or Meal, and Malted or Readily Digested Foods.**

We, JAMES SLEEMAN, of Carlton House, Portishead, in the County of Somerset, Maltster, and SAMUEL WHITE, of The Holt, Taunton, in the County of Somerset, Gentleman, do hereby declare the nature of our said invention to be as follows:—

The object of our invention is to produce alcoholic liquors, flour or meal, and malted or readily digested foods from maize.

Hitherto, despite numerous attempts by various processes and machinery, it has been found impossible to convert maize into malt (*i.e.* to germinate and wither maize in a manner analogous to the treatment of barley) or to make the conversion of maize into malt so complete as to be practically identical with barley malt and fit to be used as a substitute therefor in the various commercial uses to which barley malt is put.

The reasons for this are:—That the acrospire of maize grows outside the corn and is consequently unprotected from injury, whereas in barley the acrospire grows beneath the outer layer of husk and is thereby protected, also that the acrospire and rootlets of maize are exceptionally "fleshy," soft and tender and very liable to injury even under the most gentle handling.

We have discovered that in malting maize it is absolutely necessary to hold perfect control of the temperature of the germinating maize without being compelled to resort to turning or moving in order to keep down or to equalize the temperature of the mass of grain, such turning or moving being of necessity frequent and consequently damaging the growings of the maize.

These difficulties we have overcome in a successful manner, and the following is a description of a process by which we have obtained a malt from maize in every way practically identical with barley malt and suitable for many useful purposes.

We soak or steep the maize in water for about 80 hours, the steeping being effected in an ordinary tank or in a vessel specially contrived for aërating and germinating. The soaked grain is then subjected to aëration; this is preferably effected in a vessel, drum, or machine in which the grain is permitted to rest in layers (preferably vertical) not exceeding about two feet in thickness and so arranged with intermediate air chambers between the layers that every layer is subjected to an even and equal aeration; the air chambers are connected with suitable air supply and exhaust apparatuses so that fresh air is caused to pass evenly through each layer of grain and the gases generated are carried away by the exhaust, whereby the grain is kept at the desired temperature without the necessity for turning or moving. The aeration, temperature and germination of the growing maize must be absolutely under control whilst the grain is in a state of rest, and turning or moving must only be effected at long intervals—say, once in twelve hours—and then only to prevent the grain "packing" too tightly and growing together; the movement or turning must

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be thorough to separate and loosen the grain and yet sufficiently gentle to avoid damage.

The germination is effected at a temperature of from 80 to 85° Fahr. derived by means of moist heated air which is passed through the layers of grain, the grain being turned or moved very gently and thoroughly—say, once in twenty-
four hours. 5

As soon as germination is sufficiently advanced, drier air, in less volume, is passed through the layers of grain in order that a process analogous to what is termed “withering” in barley malting may be effected, whereby the maize is made tender and fit for brewers use. The malt is then dried and cured by
having hot dry air passed through it or by removing the malted grain to an
ordinary kiln or drying chamber. After scrubbing or brushing, in order, to
remove the dried rootlets and cleanse the malt, the malt may be used for the
production of alcoholic liquors; or it may be crushed, and the germ and husk
or portions thereof “dressed” or sifted out, to form a fine flour suitable for
the production of yeast, as well as alcoholic liquors, and for use as an article
of diet for all the purposes for which the finest wheat and corn flours are used
and is specially suitable for confectionery. Also, having been malted, the flour
is practically digested and is therefore suitable for food for invalids, infants,
and persons of weak digestion. 10 15 20

Dated 4th August 1899.

JAMES SLEEMAN.
SAMUEL WHITE.

By George Downing & Sons,
Chartered Patent Agents, 8, Quality Court, London, W.C. 25

COMPLETE SPECIFICATION.

**Improvements in or relating to the Production of Alcoholic Liquors,
Flour or Meal, and Malted or Readily Digested Foods.**

I, JAMES SLEEMAN, of Carlton House, Portishead, in the County of Somerset, Maltster, and SAMUEL WHITE, of The Holt, Taunton, in the County of Somerset, Gentleman, do hereby declare the nature of our said invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:— 30

The object of our invention is to produce alcoholic liquors, flour or meal, and malted or readily digested foods from maize. 35

Hitherto, despite numerous attempts by various processes and machinery, it has been found impossible to convert maize into malt (*i.e.* to germinate and wither maize in a manner analogous to the treatment of barley) or to make the conversion of maize into malt so complete as to be practically identical with barley malt and fit to be used as a substitute therefor in the various commercial
uses to which barley malt is put. 40

The reasons for this are:—That the acrospire of maize grows outside the corn and is consequently unprotected from injury, whereas in barley the acrospire grows beneath the outer layer of husk and is thereby protected; also that the acrospire and rootlets of maize are exceptionally “fleshy,” soft and tender and
very liable to injury even under the most gentle handling. 45

We have discovered that in malting maize it is absolutely necessary to hold perfect control of the temperature of the germinating maize without being compelled to resort to turning or moving in order to keep down or to equalize

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the temperature of the mass of grain, such turning or moving being of necessity frequent and consequently damaging the growings of the maize.

These difficulties we have overcome in a successful manner, and the following is a description of a process by which we have obtained a malt from maize in every way practically identical with barley malt and suitable for many useful purposes.

We soak or steep the maize in water for about 80 to 88 hours (according to the description of the maize) the steeping being effected in an ordinary tank or in a vessel specially contrived for aerating and germinating, towards the end of which steeping the temperature of the water and grain should be raised to 70 degrees Fahrenheit. The soaked grain is then subjected to aeration; this is preferably effected in a vessel, drum, or machine in which the grain is permitted to rest in layers (preferably vertical) not exceeding about two feet in thickness and so arranged with intermediate air chambers (about corresponding in area to the surface area of the grain) between the layers, that every layer is subjected to an even and equal aeration; the air chambers are connected with suitable air supply and exhaust apparatuses so that fresh air is caused to pass evenly through each layer of grain and the gases generated are carried away by the exhaust, whereby the grain is kept at the desired temperature, without the necessity for turning or moving. The aeration temperature and germination of the growing maize must be absolutely under control whilst the grain is in a state of rest, and turning or moving must only be effected at long intervals—say, once in 24 hours and at the most frequent period once in 12 hours—and then only to prevent the grain “packing” too tightly and growing together; the movement or turning must be thorough to separate and loosen the grain and yet sufficiently gentle to avoid damage.

The germination is effected at a temperature according to the description of the maize of from 70 to 85 degrees Fahrenheit derived by means of moist heated air which is passed through the layers of grain, the grain being turned or moved very gently and thoroughly, say, once in 24 hours.

As soon as the germination is sufficiently advanced (after about 7 days) drier air from 5 to 10 degrees warmer, in less volume, is passed at frequent intervals through the layers of grain (allowing rests of from 3 to 8 hours between) in order that a process analogous to what is termed “withering” in barley malting may be effected, whereby the maize is made tender and fit for brewers use. The malt is then dried and cured by having hot dry air (at first large volumes of moderately dry warm air for drying, followed by smaller volumes of hotter air for curing) passed through it or by removing the malted grain to an ordinary kiln or drying chamber. After scrubbing or brushing, in order to remove the dried rootlets and cleanse the grain, the malt may be used for the production of alcoholic liquors; or it may be crushed (and the germ and husk or portions thereof “dressed” or sifted out) to form a fine flour suitable for the production of yeast as well as alcoholic liquors, and for use as an article of diet for all the purposes for which the finest wheat and corn flours are used and is specially suitable for confectionery. Also, having been malted, the flour is practically digested and is therefore suitable for food for invalids, infants, and persons of weak digestion.

Any apparatus which will enable the necessary operations to be performed in the manner specified may be used, such for instance as those described in Patents No. 11804 of 1898, 18412 of 1898 and 2109 of 1899. Another apparatus suitable for the purpose consists of one or more perforated floors arranged with a hollow space beneath the same for the inlet or exhaustion of air; preferably the floor is divided into sections each of which is hinged or moveable about a centre independently of its neighbour in such a manner that by raising or tilting one section the growing grain thereupon is caused to roll gently on to a neighbouring space or empty section. The removal of the growing grain is

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thus effected from section to section thereby separating or disintegrating the grain layers without injury to the rootlets.

During the germinating stage the growing corn is frequently sprinkled with water by any known means, the temperature of the water being such that it greatly assists the regulation of the temperature of the grain; care must however be taken to drain away the surplus water from below the grain. Also, with some hard descriptions of maize it is necessary to soak or steep it for a few hours after growth has proceeded for three or four days.

In drying and curing maize it is necessary to use, at every stage, lower temperatures for a longer period than is usual with barley malt, because the husk of maize is much thinner and the grain would be more easily scorched, and also because the berry of the maize being much larger than barley it takes longer for the heat to permeate the centre of the corn and eliminate the moisture. The best temperatures have been found to be, starting at 75 degrees to 80 degrees Fahr. gradually rising to 95 degrees at the end of sixty hours; then gradually rising from 95 degrees to 130 to 140 degrees Fahr. in the next sixty hours so that the maximum temperature is maintained during the last six hours of that period.

Slight variations of these temperatures are permissible depending upon the particular description of maize used, and the particular purpose for which the malt is intended to be used.

Until arrangements have been made for the importation of maize specially selected or of maize of one years growth unmixed with that of any other year's growth (of which it is now difficult to obtain in this country a regular supply) dead or ungerminated corns may be eliminated from the malted corns by any gravitation process preferably by a strong blast of warm dry air, or they may be eliminated by water, in which the dead corns will sink and the malted corns float. In the latter process the separation must be quickly effected so that water does not permeate the malt. The latter (water) process may be effected previous to withering or previous to drying, or after drying, but in the last case more particularly the water must be quickly dried off again and not allowed to soak into the malt.

To remove the germ and husk, the dried and cured malt corns are crushed between rolls and sifted in a similar manner to the manufacture of wheat flour, the process of crushing and sifting being continued until the desired degree of disintegration and separation of the meal from husk and germ has been effected.

By another method, we remove the malt in process of drying, when it is "hand-dry" (or dried so as to contain only say 10% to 15% of moisture) and then crush it. At this stage it is easier to separate the meal from the germ and husk as there is then a greater difference between the friability of the meal and of the germ and husk; the meal disintegrates freely when crushed, whilst at this stage of dryness the germ and husk (especially the germ) is of a more glutinous character and rolls out into larger tougher flakes which are then more easily and completely separated from the meal, than when, at a later stage of drying, the germ and husk have become more brittle and more readily disintegrates under the rolling process.

When the latter method of separation is adopted the separated meal is then cured or roasted in rotating heated cylinders at the required curing temperature when it is in a condition suitable for brewing or distilling.

When intended for food the meal is subjected to a finer grinding and dressing in order to obtain a finer purer flour. This flour can then be mixed in varying proportions as desired, with ordinary flour and used for ordinary dietetic purposes. Or it can be used with an admixture of dessicated milk, meat extract, or any other desirable albuminous substance to form a partially digested food easily assimilable by infants and by people of weak digestion.

The process of separation hereinbefore described can be made use of also to

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eliminate from the malt flour the particles (if any) of unmalted starch, as the latter being more granular, less friable, and less easily disintegrated, would not pass with the malt flour, in the finest separation.

The separated, germ, husk, and starch particles are used for, and are valuable
5 for cattle foods.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. The herein described process and the modifications thereof for the treat-
10 ment of maize substantially as and for the purposes set forth.

2. A malted maize produced as herein described, and the meal and fine flour manufactured therefrom, substantially as and for the various purposes set forth.

Dated 2nd June 1900.

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